

Remarks

Claims 1 through 8, 11 through 16, 18 through 23, 26 through 29, 31 through 34 remain pending. Claims 1, 15, 16, 18, 26, 28, 29, 31 through 34 are amended.

Claims 1, 29, 33 and 34 stand objected to for grammatical informalities. Claims 1, 29, 33 and 34 are amended to correct the informalities.

Claims 31 and 32 stand objected to as dependent on cancelled claims. Claims 31 and 32 are amended to depend from pending claims 1 and 18 respectively.

Claims 1 through 11 and 14, 15, 16, 18 through 23, 26 through 29 and 31 through 34 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Geiger, et al., "INTMDCT - A Link Between Perceptual and Lossless Audio Coding," IEEE Proceedings of ICASSP (2002), in view of Oshikiri, Sound Encoding Apparatus and Sound Encoding Method, U.S. Patent Publication 2005/0252361 (Nov. 17, 2005) and further in view of Li, System and Method for Embedded Audio Coding with Implicit Auditory Masking, U.S. Patent Publication 2003/0187634 (Oct. 2, 2003). The Examiner asserts that it would have been obvious to combine the cited references to yield the inventions claimed in independent claims 1, 15, 16, 18, 28 and 29. Independent claims 1, 15, 16, 18, 26, 28 and 29 are amended to include a limitation that for each frequency band s of a plurality of frequency bands, the maximum bit-plane M(s) that contains a non-zero bit-plane symbol for the frequency band s of the error signal. This limitation is supported in the specification as filed on page 34, lines 25 to 29.

As discussed in previous responses, Geiger fails to disclose bitplane coding the error signal based on perceptual information wherein perceptual information of the digital signal is determined using a perceptual model. Therefore, Geiger fails to disclose the amended claim limitation "for each frequency band s of a plurality of frequency bands, the maximum bit-plane M(s) that contains a non-zero bit-plane symbol for the frequency band s of the error signal."

As presented earlier, Oshikiri discloses an acoustic coding apparatus 1300 with a perceptual masking calculation section 1301 and an enhancement layer coder 1302. The perceptual masking calculation section 1301 calculates perceptual masking indicating the magnitude of a spectrum which can not be perceived by the human auditory sense and outputs the perceptual masking to the enhancement layer coder 1302 (paragraphs [120]-[121] and FIG. 15 of Oshikiri). The enhancement layer coder 1302 is mainly constructed of an MDCT section 1501 and an MDCT coefficients quantizer 1502 (paragraph [133] and FIG. 17 of Oshikiri). Further, the MDCT coefficient quantizer 1502 uses the perceptual masking output from the perceptual masking calculation section 1301 for the MDCT coefficients output from the MDCT section 1501 to classify the MDCT coefficients into coefficients to be quantized and coefficients not to be quantized and encodes only the coefficients to be quantized (paragraph [0135] of Oshikiri).

Thus, it can be seen that the perceptual masking output from perceptual masking calculation section 1301 is for quantization purpose, but not for bitplane coding which is not mentioned in Oshikiri at all.

Accordingly, Oshikiri also fails to disclose the amended limitation of the independent claims of the present application.

In Li, the bit-plane coding is started from the most significant bit (MSB) which is defined as the highest bit position of a binary representation of a spectral coefficient, which is the L in Equation 5 and paragraph [0091] of Li. L is a constant for all coefficients and all critical bands (e.g., when 32 word length data is used L will be 32 and will be constant for all coefficients to be coded.)

The bit-plane scan order described in Li is well-known in modern media coding systems such as JPEG 2000. It is only optimized for Minimum Mean Square Error (MMSE), however is not optimized for perceptual quality. To compensate for this problem, Li further describes an implicit auditory masking model to readjust the bit-plane coding order based on already encoded bit-plane symbols.

In contrast, according to the amended independent claims, the claimed bit-plane coding is based on the maximum bit-plane containing a non-zero bit-plane symbol, i.e. the bit position that contains the first non-zero bit-plane symbol of each frequency band. For example, in one embodiment, the bit-plane coding is started at the maximum bit-plane containing a non-zero bit-plane symbol. Since it depends on the presence of non-zero bit-plane symbols in the error signal per frequency band, M(s) may be variable and may differ from frequency band to frequency band. It should be noted that this is also reflected by the index "s" of "M(s)".

The approach according to the amended independent claims is counter-intuitive and not obvious from prior art because in

prior art, as described in Li, the bit-plane coding is started from the highest bit-position L of all coefficients, and then continues progressively to L-1, L-2,... In contrast, according to the amended independent claims, bit-plane coding is based on the first non-zero bit-position M(s) for each frequency band s which is not optimal unless the bit-plane coding is performed on an error signal from a perceptual coder like it is done in accordance with the independent claims. In the presently claimed invention, an optimal encoding of error signals is provided while Li's method, which is not designed for coding an error signal but of an input audio signal (see for example paragraph [0084] in Li), cannot be equally optimally used for coding an error signal and gives no hint to the person skilled in the art how this method should be adapted to achieve optimal encoding of error signals as it is achieved in the presently claimed invention.

Neither Geiger, Oshikiri, Li or any combination of the references provides any hint or suggestion for a person skilled in the art to arrive at the presently pending claims. Therefore, the subject matter of amended independent claims is not obvious in light of Geiger, Oshikiri, Li or any combination thereof. This rejection should be withdrawn.

Claims 2 through 8, 12, 13, 14, 19 through 23, 25 through 31 and 32 depend from independent claims 1, 15, 16, 18, 28 and 29 respectively and thus, the rejections regarding the dependent claims should also be withdrawn.

Conclusion

This response has addressed all of the Examiner's grounds for rejection. The rejections based on prior art have been traversed. Reconsideration of the rejections and allowance of the claims is requested.

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